

aluminum gutter draining into a copper downspout would not have the same effect except at the connection point of the two metals. NRCA recommends designers specify the use of compatible metals or properly prepared or isolated metals in roof systems and related flashings.

1.7 OIL-CANNING

Oil-canning is an inherent phenomenon prevalent in light-gauge, cold-formed metal products. Oil-canning refers to physical distortions in the flatness of metal; however, this condition is only aesthetic in nature and does not have any adverse effect on the structural integrity or the weatherproofing capability of a panel. Because some paint finishes, clear coats and metals are highly reflective and bright, distortions can be quite apparent. The visual effects of oil-canning can be exacerbated by changing or varying light conditions. Many metal roof panel manufacturers issue disclaimers regarding oil-canning. If a specifier intends to reduce the severity of oil-canning, careful design consideration should be given to the width, gauge and profile of the specific product. NRCA does not consider oil-canning in itself to be a cause for rejection.

There are a number of potential causes of oil-canning; however, all are attributable to residual stresses, either induced or redistributed, for different reasons.

- Residual stress during coil production can contribute to camber, the deviation of a side edge from a straight line. This longitudinal curving will place additional stress on metal as it is pulled through a roll-forming machine, which attempts to form a straight edge on the panel.
- Slitting a master coil can release and redistribute stresses, especially if the slitter blades are out of adjustment or dull.
- Roll-forming equipment can cause oil-canning. As metal is run through rolling stations, it is placed under stress and can stretch, particularly if the equipment is out of adjustment or operated beyond its limitations.

Despite having a properly adjusted, well-maintained roll-forming machine and good-quality metal, oil-canning can still occur when panels are installed. It can result from temperature fluctuations and cycles; an uneven substrate or irregular bearing on the structural framing; structural movement; misalignment of clips; or overtightening of the mechanical fasteners.

The following precautions and considerations should assist in the reduction of oil-canning and its visual effects:

- Specifying that coil stock be tension-leveled to ensure flatness of material. Tension-leveling is a mechanical operation in which coil metal is stretched beyond its yield point.
- Using a heavier-gauge metal that is more rigid and less likely to oil-can than lighter-gauge material
- Limiting individual panel pan widths. Larger width/thickness ratios are more likely to show oil-canning.
- Using stiffening ribs or striations in the field of the metal panel.

The following considerations help reduce the visual effects of oil-canning:

- Using low-gloss finishes or special surface textures such as embossing or striations
- Considering using metals that weather naturally, as these metals typically dull or fade over time with the development of a layer of oxidation